

09 / 485034

420 Rec'd PCT/PTO 02 FEB 2000

Practitioner's Docket No. PAR 2 0013**PATENT**

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P. § 601, 7th ed.

**TRANSMITTAL LETTER TO THE U.S. DESIGNATED OFFICE (DO/US)—
ENTRY INTO THE U.S. NATIONAL STAGE UNDER CHAPTER I**

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/GB99/01456	26 May 1999	03 June 1998
TITLE OF INVENTION		
CONSTRUCTION MATERIALS		
APPLICANT(S)		
Robert John BLYTHE		

Box PCT

**Assistant Commissioner for Patents
Washington D.C. 20231**

ATTENTION: DO/US

NOTE: The completion of those filing requirements that can be made at a time later than 20 months from the priority date results from the Commissioner exercising his judgment under the authority granted under 35 U.S.C. § 371(d). The filing receipt will show the actual date of receipt of the last item completing the entry into the national phase. See 37 C.F.R. § 1.491, which states: "An international application enters the national stage when the applicant has filed the documents and fees required by 35 USC 371(c) within the periods set forth in § 1.494 and § 1.495."

CERTIFICATION UNDER 37 C.F.R. § 1.10*

(Express Mail label number is mandatory.)

(Express Mail certification is optional.)

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date 2 February 2000, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL530712595US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Ben TRELLA

(type or print name of person mailing paper)

Signature of person mailing paper

- **WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.
- **WARNING:** Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b). "Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will not be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

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WARNING: Where the items are those that can be submitted to complete the entry of the international application into the national phase subsequent to 20 months from the priority date, the application is still considered to be in the international stage. And if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (because international application papers are not covered by an ordinary certificate of mailing. 37 C.F.R. § 1.8(2)(ii)).

WARNING: Documents and fees must be clearly identified as a submission to enter the national stage under 35 U.S.C. § 371, otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

WARNING: Failure to pay the national fee within 20 months from the priority date will result in the abandonment of the application. The time for payment of the basic fee is not extendable. M.P.E.P. § 1893.01(a)(1), 6th ed., rev. 3.

1. Applicant herewith submits to the United States Designated Office (DO/US) the following items under 35 U.S.C. § 371:

- a. This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
- b. The U.S. National Fee (35 U.S.C. § 371(c)(1)) and
 other fees (37 C.F.R. § 1.492), as indicated below:

Additional Claims Fee (small entity)

Assignment Recordation Fee

2025 RELEASE UNDER E.O. 14176

(Transmittal Letter to the United States Designated Office (DO/US)—Entry into National Stage under
35 U.S.C. § 371 [13-6]—page 2 of 8)

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2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
<input checked="" type="checkbox"/> * See Prelim. Amend.	TOTAL CLAIMS	26 -20=	6	$\times \$ 18.00 =$	\$ 108.00
	INDEPENDENT CLAIMS	1 -3=	-	$\times \$ 78.00 =$	0.00
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00	
BASIC FEE**	The international search fee, as set forth in § 1.445(a)(2) to be paid to the US PTO acting as an International Searching Authority:				
	<input type="checkbox"/> has been paid (37 CFR 1.492(a)(2)) \$760.00 <input checked="" type="checkbox"/> has not been paid (37 CFR 1.492(a)(3)) \$970.00 <input type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 CFR 1.492(a)(5)) \$840.00				
	Total of above Calculations				
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 CFR 1.9, 1.27, 1.28)				
	Subtotal				
	Total National Fee				
	Fee for recording the enclosed assignment document \$40.00 (37 CFR 1.21(h)). (See Item 10 below). See attached "ASSIGNMENT COVER SHEET (37 C.F.R. § 3.34)".				
TOTAL	Total Fees enclosed				

* See attached Preliminary Amendment Reducing the Number of Claims.

****WARNING:** "To avoid abandonment of the application, the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 20 months from the priority date: *** (2) the basic national fee (see § 1.492(a)). The 20-month time limit may not be extended." 37 C.F.R. § 1.494(b).

(Transmittal Letter to the United States Designated Office (DO/US)—Entry into National Stage under 35 U.S.C. § 371 [13-6]—page 3 of 8)

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i. A check in the amount of \$ 579.00 to cover the above fees is enclosed.

ii. Please charge Account No. _____ in the amount of \$ _____.

A duplicate copy of this sheet is enclosed.

WARNING: If the translations of the international application and/or the oath or declaration have not been submitted by the applicant within twenty (20) months from the priority date, the applicant will be so notified and given a period of time within which to file the translation and/or oath or declaration in order to prevent abandonment. The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than twenty (20) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than twenty (20) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 will apply. 37 C.F.R. § 1.494(c).

3. A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

a. is transmitted herewith.

b. is not required, as the application was filed with the United States Receiving Office.

c. has been transmitted

i. by the International Bureau. Date of mailing of the application (from form PCT/IB/308): 09 December 1999

ii. by applicant on _____ Date

NOTE: Section 1.494(b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 20 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies the applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage and applicant has received notice from the International Bureau, applicant need only pay the basic national fee by 20 months from the priority date." [This can now be paid subsequently with a surcharge.] Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35.

4. A translation of the International application into the English language

(35 U.S.C. § 371(c)(2)):

a. is transmitted herewith.

b. is not required as the application was filed in English.

c. was previously transmitted by applicant on _____ Date

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5. Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 indicates that 37 C.F.R. § 1.494(d) was "amended to clarify the existing practice that PCT Article 19 Amendments must be submitted by 20 months from the priority date, which time may not be extended." This Notice further advises: "Of course, the failure to do so does not result in loss of the subject matter of PCT Article 19 amendments. The applicant may submit that subject matter in a preliminary amendment filed under Section 1.121. In many cases, filing an amendment under Section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 35. See item 11(c) below. See also 37 C.F.R. § 1.494(d).

- a. are transmitted herewith.
- b. have been transmitted
 - i. by the International Bureau. Date of mailing of the amendment (from form PCT/IB/308): _____
 - ii. by applicant on _____
Date _____
- c. have not been transmitted, as
 - i. no notification has been received that the International Search Authority has received the Search Copy.
 - ii. the Search Copy was received by the International Searching Authority, but the Search Report has not yet been issued. Date of receipt of Search Copy (from form PCT/ISA/202): _____
 - iii. applicant chose not to make amendments under PCT Article 19. Date of mailing of Search Report (from form PCT/ISA/210): 08 September 1999
 - iv. the time limit for the submission of amendments has not yet expired. The amendments, or a statement that amendments have not been made, will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. § 371(c)(3)):

- a. is transmitted herewith.
- b. is not required as the amendments were made in the English language.
- c. has not been transmitted for reasons indicated at point 5(c) above.

7. An oath or declaration of the inventor, including power of attorney, (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

- a. was previously submitted by applicant on _____
Date _____
- b. is submitted herewith, and such oath or declaration
 - i. is attached to the application.
 - ii. identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or (c) and 5(b); and states that they were reviewed by the inventor, as required by 37 C.F.R. § 1.70.
 - iii. will follow.

Other document(s) or information included:

8. An international Search Report or Declaration under PCT Article 17(2)(a):

- is transmitted herewith.
- has been transmitted by the International Bureau. Date of mailing (from form PCT/IB/308): 09 December 1999.
- is not required, as the application was searched by the United States International Searching Authority.
- will be transmitted promptly upon request.
- has been submitted by applicant on _____
Date
- is not transmitted, as the international search has not yet issued.

9. An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

- is transmitted herewith.
Also transmitted herewith is (are)
 - Form PTO—1449 (PTO/SB/08A and 08B)
 - Copies of citations listed
- will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).
- was previously submitted by applicant on _____
Date

10. An assignment document is transmitted herewith for recording. A separate

- "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or
- FORM PTO—1595

is also attached.

Please mail the recorded assignment document to:

- the person whose signature and address appears below.
- the following:

Thomas E. Kocovsky, Jr.
FAY, SHARPE, FAGAN, MINNICH & McKEE, LLP
1100 Superior Avenue, Seventh Floor
Cleveland, OH 44114-2518

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11. Additional documents

- a. Copy of request (PCT/RO/101)
- b. International Publication No. WO 99/63162
 - i. Specification, claims and drawing
 - ii. Front page only
- c. Preliminary amendment (37 C.F.R. § 1.121)
- d. Other Copy of Search Report

12. The above checked items are being transmitted

- a. before the 18th month publication.
- b. after publication and the article 20 communication, but before 20 months from the priority date.
- c. after 20 months (revival).

NOTE: Petition to revive (37 C.F.R. § 1.137(a) or (b)) is necessary if 35 U.S.C. § 371 requirements are submitted after 20 months.

13. Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____ namely:
Date**AUTHORIZATION TO CHARGE ADDITIONAL FEES**

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 06-0308

- 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: Because failure to pay the national fee within 20 months without extension (37 C.F.R. § 1.494(b)(2)), results in abandonment of the application, it would be best to always check the above box.

- 37 C.F.R. § 1.492(b), (c), and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment, prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

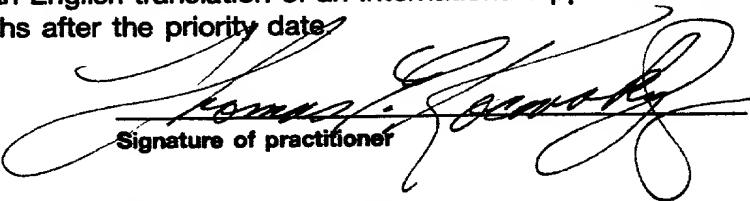
- 37 C.F.R. § 1.17 (application processing fees)
- 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).

37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b)).

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying or at the time of paying . . . issue fee. . ." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 20 months after the priority date).



Signature of practitioner

Thomas E. Kocovsky, Jr.

(type or print name of practitioner)

FAY, SHARPE, FAGAN,
MINNICH & MCKEE, LLP

P.O. Address

1100 Superior Avenue, Seventh Floor
Cleveland, OH 44114-2518

Reg. No. 28,383

Tel. No.: (216) 861-5582

Customer No.:

09/485034

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:)	Examiner:
R. BLYTHE)	
)	Art Unit:
Serial No.: Unknown)	
)	
Filed: Herewith)	
)	
For: CONSTRUCTION MATERIALS)	
)	
Attorney Docket No.:)	Cleveland, OH 44114
PAR 2 0013)	February 2, 2000

PRELIMINARY AMENDMENT

Assistant Commissioner
For Patents
Washington, D.C. 20231

Dear Sir:

Prior to examination of the subject application, applicant respectfully requests consideration of the following amendments:

In the Claims:

In claim 3, line 1, please delete "or 2".

In claim 4, line 1, please delete "2 or 3,".

In claim 5, line 1, please delete "Claims 1 to 4" and insert therefor -- claim 1 --.

In claim 7, lines 1-2, please delete "any of the preceding claims" and insert therefor -- claim 1 --.

In claim 9, lines 1-2, please delete "any of the preceding claims" and insert therefor -- claim 1 --.

In claim 10, line 1, please delete "Claims 1 to 7" and insert therefor -- claim 1 --.

In claim 11, lines 1-2, please delete "any of the preceding claims" and insert therefor -- claim 1 --.

In claim 12, lines 1-2, please delete "any of the preceding claims" and insert therefor -- claim 1 --.

"Express Mail" Mailing Label Number EL530712595US

Date of Deposit: February 2, 2000

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to:

Assistant Commissioner for Patents Washington, D.C. 20231.

By: Ben TRELLA

In claim 14, line 1, please delete "Claims 1 to 11" and insert therefor -- claim 1 --.

In claim 15, line 2, please delete "any of the preceding claims" and insert therefor -- claim 1 --.

In claim 17, line 2, please delete "any of Claims 1 to 14" and insert therefor -- claim 1 --.

In claim 19, line 2, please delete "any of Claims 1 to 14" and insert therefor -- claim 1 --.

In claim 21, line 1, please delete "or 20".

In claim 22, line 1, please delete "20 or 21,".

In claim 23, line 1, please delete "20 or 21,".

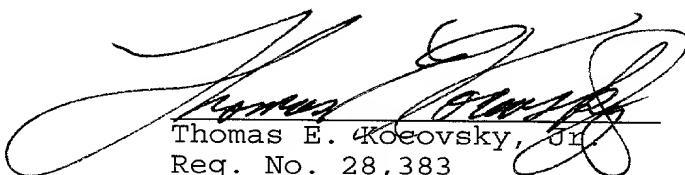
Please cancel claims 27-34 from further consideration.

REMARKS

The purpose of this amendment is to revise the claims to remove multiple dependency.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & MCKEE, LLP



Thomas E. Koeovsky, Jr.
Reg. No. 28,383
1100 Superior Avenue
Seventh Floor
Cleveland, OH 44114-2518
(216) 861-5582

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:) Examiner:
R. BLYTHE)
)
Serial No.: Unknown) Group Art Unit:
)
Filed: Herewith)
)
For: CONSTRUCTION MATERIALS)
)
Attorney Docket No.:) Cleveland OH 44114-2518
PAR 2 0013) January 14, 2000

37 C.F.R. 1.27 STATEMENT OF STATUS AS
A SMALL BUSINESS ENTITY

Assistant Commissioner
For Patents
Washington, D.C. 20231

Dear Sir:

The undersigned affirms:

That he is an officer of the assignee GENSHAW LIMITED, a Corporation of England, having a principal place of business at: Upper Higham Lane, Rushden, Northamptonshire NN10 0SU, ENGLAND, and is empowered to act on behalf of the assignee; the assignment is being filed concurrently herewith for recording;

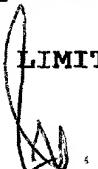
That the assignee GENSHAW LIMITED, together with all of its affiliates combined had fewer than five hundred (500) employees including full-time, part-time, and temporary employees on the average during each pay period of the previous fiscal year of the assignee and its affiliates; and,

That the assignee has not assigned, granted, conveyed, or licensed, and is under no obligation under contract or law to assign, grant, convey, or license any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business under 37 C.F.R. 1.9(d) or a nonprofit organization under 37 C.F.R. 1.9(e).

-2-

The undersigned acknowledges a duty to file, in this application or patents issuing thereon, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate.

The undersigned further declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful and false statements may jeopardize the validity of the application or any patent issuing thereon.

GENSHAW  LIMITED

By: 

Date: 25/1/00

Title: MANAGING DIRECTOR

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CONSTRUCTION MATERIALS

This invention relates to construction materials suitable for use as, or in, a wearing course, for example for children's play areas, athletics and other games, and horse riding. It also relates to methods of making the construction materials and to polymers in particular granulated or other comminuted form for use in said materials.

During recent years there has been adopted, as the wearing course of running racks and similar surfaces on which games are played, a polymeric material in compounded form known as EPDM. "EPDM" refers to terpolymers obtained by the copolymerisation of ethylene and propylene with a small proportion of a diene monomer to permit conventional sulphur vulcanisation at sites of olefinic unsaturation. Subsequently, similar wearing courses have been used as impact-absorbent means in locations where safety is a prime requirement, for example children's play areas; commonly with a bulk (base) layer of recycled rubber granules.

However, in spite of its widespread use, these EPDM materials suffer from several disadvantages of which the major ones are as follows:

(a) Due to pressure from the sports/safety surface construction industry to reduce the cost of EPDM the formulation has been cheapened, using less polymer

than originally formulated and now often relies on off-specification polymer, that is polymer of an inferior grade, to further reduce costs. This insistence of the users effectively controls the expansion of the application of sports and safety surfaces because there is insufficient off-specification EPDM available.

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- (b) Owing to stringent laws in USA, off-specification EPDM material cannot be used in that country.
- (c) The dilution of the formulation and the use of off-specification polymer has reduced the quality of surfaces obtained using EPDM compared to the original concept.
- (d) Off-specification EPDM is typically brown in colour instead of water white. The resultant compound requires the use of high levels of titanium dioxide to mask the brown background colour and/or uses high pigment concentrations. The consequence is that the product is expensive due to the large amount of pigment required to mask the brown colour.
- (e) The granulation of the compounded EPDM produces high dust content (ca.20%) which has to be removed from the granules. There is a small outlet use for dust (0 - 0.5 mm and 0.5 - 1.5mm) in texture sprays and

recycling into virgin EPDM compounds. However, the disposal of dust is often expensive and reduces the cost effectiveness of the product.

5 (f) With regard to the important use in playground safety surfaces, British Standard BS 7188: 1989 specifies an abrasion test which, at present, materials based on current EPDM granules bound with current moisture-curing polyurethane frequently fail to meet. This prevents many safety surface constructors using coloured EPDM when their customers require full 10 compliance with British Standard BS 5696:1986.

15 It has now been found, according to the present invention, that excellent construction materials for use in the preparation of wearing courses can be obtained by using as their polymer component (or, at least one of their polymer components) a thermoplastic elastomer (also referred to below as "TPE"), thereby avoiding, or at least mitigating to a substantial extent, the disadvantages of the EPDM-based materials referred to above.

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Accordingly, in a first aspect the present invention provides a construction material for use as, or in, a wearing course, which comprises an agglomerate of granules of a thermoplastic elastomer.

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By way of example, the thermoplastic elastomer can be a copolymer, for instance a block copolymer of the styrene type. Suitable examples of the latter are one or more of:

styrene-butadiene-styrene (SBS) block copolymers,

styrene-isoprene-styrene (SIS) block copolymers and

5 styrene-ethylene-butadiene-styrene (SEBS) block copolymers.

Thermoplastic elastomers have, in general, a molecular weight in the range 50,000 to 500,000. They can be conventionally compounded but do not require a cross-linking system. Where, for example, the thermoplastic elastomer is an SBS block copolymer, when heated the blocks of polymer take up a random distribution allowing shaping and forming. On cooling, it is believed that the polystyrene blocks form domains joined by polybutadiene bridges. This mechanism produces a balance of stiffness and elasticity similar to cross-linking. On re-heating the domains disappear and the thermoplastic elastomer reverts to being thermoplastic.

Examples of thermoplastic elastomers suitable for use in the present invention are ones sold under the Trade Marks Calprene, 20 Finaprene, and/or Europrene Sol.

The thermoplastic elastomer is normally used in a compounded form. Suitable compounds, given by way of example, are ones containing one or more of fillers, processing oils, processing aids, antioxidants and pigments.

25 The thermoplastic elastomer used should, in general, have



a softening temperature to suit the ambient conditions in which the construction material of the invention is to be used.

5 In general the thermoplastic elastomer is one containing a white or coloured pigment with a view to effecting a desirable appearance in the laid wearing course though, if appropriate, the elastomer can be used without added pigment.

10 The granules of the agglomerate can be of any suitable shape and size. In general the size, and especially the shape, are dictated by the properties required from the wearing course, and especially in the amount of any binder used in producing the agglomerate. Thus, on the one hand, it is in general preferred to avoid using granules of spherical or spheroidal shape as such shapes do not result in good binding contact between adjacent granules. On the other hand, if the granules have too great a surface area it can result in an excess amount of binder being required. It is preferred that the granules be angular granules, that is, granules having at least one edge in their periphery.

15 20 In particular, the granules can be multi-facet granules, especially granules having up to eight facets, especially five, six or seven facets. With a view to avoiding the requirement of an excess amount of binder (where used), it is preferred that the granules have smooth surfaces.

With regard to size of the granules, it is normally convenient for them to be of a size in the range from 0.5mm to 10mm, that is, all of the granules will pass a 10mm mesh but all

will be retained by a 0.5mm mesh. A preferred size is in the range from 1mm to 4mm.

The TPE granules can be formed into an agglomerate using a liquid or other binder, for example a polyurethane binder. The binder, whether polyurethane or otherwise, can be used in any suitable amount, the amount being usually a balance between, on the one hand, achieving satisfactory agglomeration between the granules and, on the other hand, economy in the amount of binder used. Suitable amounts of binder, especially where a polyurethane binder is used, are in the range from 5 to 30 parts by weight, that is, 5 to 30 parts by weight of the binder per 100 parts by weight of the elastomer (or compounded elastomer), and especially 10, 15, 20, 25 or other amount in the range from 10 to 25 parts by weight of the binder.

As an alternative to the use of a binder - or even as an auxiliary to the use of a binder - the agglomerate can be formed by melding the granules, that is by melting or softening their surfaces to such an extent that they will bond together, if necessary, under the influence of applied external pressure. Where melding is used it can be, for example, effected by the use of infra red radiation, hot air, microwave radiation or by the use of a hot platen. Where a hot platen is used it is usually to provide a pre-fabricated wearing course sheet or other member for subsequent laying. By use of a hot platen there can be obtained pre-fabricated members having either a smooth, impervious surface or a textured surface, for example one having



appropriate drainage channels or other three-dimensional effect.

5 In a second aspect the present invention provides angular or multi-facet granules of a thermoplastic elastomer suitable for use in the construction material of the first aspect of the invention.

10 In a third aspect, the present invention provides a composition suitable for preparation of the construction material of the first aspect of the invention, the composition comprising:

- (a) a first component comprising a granular thermoplastic elastomer; and
- 15 (b) a second component comprising a binding agent for the granules.

20 The thermoplastic elastomer granules can be mixed with the binder to produce the blended composition of the invention by conventional means used for mixing granules of EPDM with binder. The resulting blended product can be laid as a wearing course by conventional means, for example by a wet-pour technique and, if appropriate, surface pressing.

25 The advantages of the construction materials of this invention (at least in their preferred forms) compared with the EPDM materials can be summarised as follows:

1. They fully meet BS 5696 (see Tables below)
2. Bright colours can be obtained at no extra cost.
- 5 3. Improved efficiency of use (see Tables below)
4. Resistance to high concentrations of UV light and ozone (see Tables)
- 10 5. Use of on-specification polymer
6. Dust produced in the granulation process is recyclable into its own colour formation.
- 15 7. Constructions using thermoplastic elastomer exclusively are recyclable.

EXAMPLES

20 Preferred embodiments of the several aspects of the present invention are illustrated by the following Examples.

Example 1

25 This Example describes the preparation of a blue pigmented granular TPE of the invention, the TPE being a styrene-butadiene-styrene (SBS) block copolymer.

A sheet of compounded pigmented styrene-butadiene-styrene-copolymer sold under the Trade Mark TPR 99 (ex Manchester Rubber) was granulated using an Alpine Highspeed machine to produce a granular product.

5

The granular product was then subjected to the action of a cyclone to remove dust and leave a product consisting substantially of 100% angular granules (as herein defined). The size distribution of the granules, compared with a typical EPDM product, is given below:

	TPE (%)	EPDM (%)
Passing 4.0mm	99.0	99.8
Passing 2.8mm	55.5	74.8
Passing 2.0mm	12.8	34.0
Passing 1.0mm	0.8	6.5

Example 2

20

This Example describes the preparation of a thermoplastic composition for laying as a wearing course.

25

The pigmented granular material obtained as product of Example 1 was blended with a liquid polyurethane binder sold by Stockmeier under the Trade Name STOBIELAST S133, the polyurethane binder being used in an amount of 15 parts per 100 parts of the granular material (by weight). The blending was carried out in a Crete angle pan mixer.

The resulting product was an easily worked, evenly coated admixture of rubber and binder.

5

Comparative Example A

For the purpose of comparison, Example 1 was repeated but using, instead of the styrene-butadiene-styrene block copolymer, an EPDM material of the kind used for the preparation of conventional wearing courses. The resulting product also has a particle size such that all of it would pass through a 4mm mesh and a small amount passing through a 1mm mesh.

10

15

Comparative Example B

For the purpose of comparison, Example 2 was repeated but using, instead of the product of Example 1, the product of Comparative Example A, and the polyurethane binder was used in an amount of 17.5 parts per 100 parts of EPDM (by weight)

20

Example 3

This Example describes the use of the blended product of Example 2 as a wearing course.

25 Into a flat mould 7 cm. deep and of lateral dimensions 1 metre x 1 metre was spread a support or bulk layer 5cm deep of a support material comprising a blend of:

- (a) rubber granules of sizes in the range 2mm to 6mm and

(b) a liquid polyurethane binder, the binder being in an amount of 8 parts per 100 parts of rubber (by weight). The rubber granules had been obtained by granulating rubber of scrap truck tyres.

5

24 hours after laying the support layer there was spread on its upper surface a 2cm wearing layer of the blended product of Example 2 above, the support layer being consolidated by pressure applied using a straight edge trowel.

10

Comparative Example C

Example 3 was repeated but using the blended product of Comparative Example B instead of the blended product of Example 2.

15

The products of Example 3 and Comparative Example C were tested according to BS 7188:1989 (Methods of test for impact-absorbing playground surfaces), and the Ease of Ignition test was made according to BS 4790:1987. The requirements of BS 5696: 20 1986 are shown in a separate column.

The results obtained are shown below. It will be seen that in almost every test the product based on TPE was substantially better than that based on EPDM.

25

TESTING IMPACT ABSORBING PLAYGROUND SAFETY SURFACES ACCORDING TO BS 7188:1989

12

TPE EPDM Specification

	TPE	EPDM	Specification
<u>Critical fall height (m)</u>	1.66	1.67	N/A

Resistance to Abrasive wear

5 weight loss (g) unaged

1000 cycles (A)	0.82	1.26
2000 cycles	0.70	0.98
3000 cycles	0.71	1.00
4000 cycles	0.57	0.87
10 5000 cycles (B)	0.64	0.86

<u>Wear Index (g/1000 cycles)</u>	0.82	1.26	< 1.00
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<u>Wear Ratio (A/B)</u>	1.28	1.46	1.0 - 3.0
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Aged Wear

Heat

<u>Wear Index (g/1000)</u>	0.57	0.98	< 1.00
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<u>Wear Ratio (A/B)</u>	1.33	1.36	1.0 - 3.0
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Water

<u>Wear Index (g/1000)</u>	0.72	1.04	< 1.00
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20 <u>Wear Ratio (A/B)</u>	1.31	1.55	1.0 - 3.0
----------------------------	------	------	-----------

Xenon

<u>Wear Index (g/1000)</u>	0.56	1.07	< 1.00
----------------------------	------	------	--------

<u>Wear Ratio (A/B)</u>	1.17	1.85	1.0 - 3.0
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Slip Resistance

25 Dry	92	89	> 40
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Wet	50	44	> 40
-----	----	----	------

Ease of Ignition

Time to flame extinction

13

(secs)	Did not ignite	18
Time to smoke extinction (secs)	300	42
Maximum Radius of damage (mm)	16.5	14
		< 35*

* according to BS 4790

5

Resistance to Indentation

load on (90 sec) mm	3.5	25.2	
Load on (15 min) mm	8.8	29.7	Resist.
			Puncture
Load Off (90sec) mm	8.0	5.8	
Load off (15 min) mm	8.0	3.7	
Load off (150min) mm	7.7	3.0	
Load off (22 hrs) mm	6.5	2.8	

10
15
20
25

Covering rate Kg/m ²	18.7	23.8
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BS 7188:1989 Methods of test for impact absorbing playground surfaces.

20 BS 5696: 1986 Playground equipment intended for permanent installations outdoors

BS 4790: 1987 Method for determination of the effects on a small source of ignition on textile floor coverings (hot metal nut method)

Example 4

Example 2 was repeated but using 20 parts (instead of 15 parts) of the polyurethane binder per 100 parts of the granular material (by weight).

5

Comparative Example D

Comparative Example B was repeated but using 20 parts (instead of 15 parts) of the polyurethane binder per 100 parts of the granular material (by weight).

10

Example 5

This Example describes the use of the blended product of Example 4 as a wearing surface of an impact-absorbent structure.

15

Into a flat mould 2 cm deep and of lateral dimensions 0.1 metre x 0.1 metre was spread a 2 cm wearing layer of the blended product of Example 2 above, the wearing layer being consolidated by pressure applied using a straight edge trowel. No bulk (support) layer was used.

20

Comparative Example E

Example 5 was repeated but using the blended product of Comparative Example D instead of the blended product of Example 2. The polyurethane binder was used in an amount of 20 parts per 100 parts of EPDM (by weight).

ACCELERATED ATMOSPHERIC EXPOSURE

The products of Example 5 and Comparative Example E were subjected to an accelerated ageing test on an "EMMAQUA Fresnel reflecting concentrator" at DSET Laboratories, Phoenix, Arizona, USA. The results obtained were as follows, the heading "TPE" indicating the product of Example 4 and "EPDM" the product of Comparative Example D.

	TPE	EPDM
U/V Dose MJ/m ²	414	414
Temperature at the surface (maximum) °C	57	57
Effect	No visible deterioration	Significant hardening

NB The exposure in this test was equivalent to 36 months exposure under typical weather conditions in England.

The construction materials of the present invention can be used in a wide variety of indoor and outdoor applications. They can, for example, be used by laying at the location where they are to be used, for example by a wet-pour technique, or they can be pre-formed, for example as tiles, blocks, sheets or other structural elements, for subsequent placement.

Preferred compounded thermoplastic elastomer materials used for making granular materials of the present invention have one or more of the following physical properties (measured according to BS 903) :

5

	Tensile Strength (MPa) - greater than 2.0, for example	5.5
	Elongation at break (%) - greater than 200, for example	785.0
10	Hardness IRHD - in the range 30 - 90, for example	76.0
	Tear resistance kN/m - about	10.0
15	Abrasion loss mm ³ (DIN53516) - less than 450, for example	360.0
	Ageing 168 hours at 70° (change) %	
	Hardness	0
	Tensile strength	0
20	Elongation at break	0
	Specific gravity g/m ³	about 1.25

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CLAIMS

1. A construction material for use as, or in, a wearing course, which comprises an agglomerate of granules of a thermoplastic elastomer.

5 2. A construction material according to Claim 1, wherein the granules are angular or multi-facet granules.

10 3. A construction material according to Claim 1 or 2, wherein the granules have smooth surfaces.

4. A construction material according to Claim 1, 2 or 3, wherein the granules are substantially free from dust.

15 5. A construction material according to any of Claims 1 to 4, wherein substantially all of the granules are in the size range from 0.5mm to 10mm.

20 6. A construction material according to Claim 5, wherein substantially all of the granules are in the size range from 1mm to 4mm.

7. A construction material according to any of the preceding claims, wherein the thermoplastic elastomer is a block copolymer.

25 8. A construction material according to Claim 7, wherein the

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block copolymer is of the styrene type.

9. A construction material according to any of the preceding
5 claims, wherein the thermoplastic elastomer is one or more of:

10 a styrene-butadiene-styrene (SBS) block co-polymer.

15 a styrene-isoprene-styrene (SIS) block copolymer,

20 a styrene-ethylene-butadiene-styrene (SEBS) block
copolymer.

25 10. A construction material according to any of Claims 1 to 7,
15 wherein the thermoplastic elastomer is a polyurethane,
polyetherester, polyamide, polyetheramide or an elastomeric
alloy.

20 11. A construction material according to any of the preceding
claims, which includes a pigment.

25 12. A construction material, according to any of the preceding
claims, wherein the granules are agglomerated together by means
of a binder, for example a polyurethane binder.

13. A construction material according to Claim 12, wherein the
binder substantially fills the interstices between the granules.

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14. A construction material, according to any of Claims 1 to 11, wherein the granules are agglomerated together by having been melded together.

15. A granular thermoplastic elastomer suitable for use in the construction material of any of the preceding claims, wherein the granules of thermoplastic elastomer are angular or multi-facet granules.

16. A granular thermoplastic elastomer according to Claim 15, wherein the thermoplastic elastomer is a blend of a major proportion of polypropylene and a minor proportion of an ethylene-propylene copolymer, the blend being without any substantial amount of cross-linking.

17. A composition suitable for the preparation of a construction material as claimed in any of Claims 1 to 14, the composition comprising:

(a) a first component comprising a granular thermoplastic elastomer; and

(b) a second component comprising a binding agent for the granules.

18. A composition according to Claim 17, wherein the binding agent is a polyurethane binder.

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19. A wearing course comprising a laid layer of a construction material as claimed in any of Claims 1 to 14.

5 20. A wearing course according to Claim 19, which has a thickness in the range 1cm to 10cm, especially 2cm to 6cm.

21. A wearing course according to Claim 19 or 20, wherein the construction material has been compacted after laying.

10 22. A wearing course according to Claim 19, 20 or 21, which has been laid in direct contact with the ground.

15 23. A wearing course according to Claim 19, 20 or 21, wherein said layer is supported by an underlying bulk layer.

24. A wearing course according to Claim 23, wherein the bulk layer comprises a rubber in granular form.

20 25. A wearing course according to Claim 24, wherein the granules of rubber have been agglomerated by means of a binder.

26. A wearing course according to Claim 23, wherein the bulk layer has a thickness of up to 10cm, especially from 2cm to 6cm.

25 27. A construction material according to Claim 1, substantially as described herein.

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28. A construction material substantially as described in any of the foregoing Examples.

5 29. A granular thermoplastic elastomer according to Claim 15, substantially as described herein.

30. A granular thermoplastic elastomer as described in any of the foregoing Examples.

10 31. A composition according to Claim 17, substantially as described herein.

15 32. A composition suitable for the preparation of a construction material as claimed in any of Claims 1 to 14, said composition being substantially as described in any of the foregoing Examples.

20 33. A wearing course according to Claim 19, substantially as described herein.

34. A wearing course substantially as described in any of the foregoing Examples.

25

30

Docket No.: PAR 2 0013

DECLARATION FOR PATENT APPLICATION

As the below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, sole, and first inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

CONSTRUCTION MATERIALS

the specification of which is filed herewith.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

International (PCT) Application No. PCT/GB99/01456,
Filed May 26, 1999

British Patent Application No. GB 9811809.4,
Filed June 3, 1998

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112. I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

None

-2-

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

100

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